

Claims

- [1] An ion beam irradiation apparatus comprising:
- a vacuum chamber which is to be evacuated to a vacuum;
 - an ion source which is disposed inside said vacuum chamber, and which irradiates a substrate to be processed with an ion beam that is larger in width than the substrate;
 - a substrate driving mechanism which drives the substrate in said vacuum chamber in a direction that is substantially perpendicular to a width direction of the ion beam emitted from said ion source;
 - a rotation shaft which is passed through said vacuum chamber, and a center axis of which is located in a place separated from said ion source toward the substrate, and substantially parallel to a surface of the substrate;
 - an arm which is disposed inside said vacuum chamber, and which supports said ion source through said rotation shaft; and
 - a motor which is disposed outside said vacuum chamber, and which reciprocally rotates said rotation shaft,
- said ion source being supported to be rotatable about said center axis of said rotation shaft.
- [2] An ion beam irradiation apparatus according to claim 1, wherein a distance between said center axis of said rotation shaft and the surface of the substrate is equal to or less about a half of a width of said ion source on a side of a rotation direction, or a width on a side of an outlet of said ion source.

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[3] An ion beam irradiation apparatus according to claim 1 or 2, wherein said rotation shaft and said arm are configured by a hollow magnetic member to have a magnetic shielding function, and set to a ground potential, and a conductor through which an electric power is supplied from an outside of said vacuum chamber to said ion source is passed through in said rotation shaft and said arm.

[4] An ion beam irradiation apparatus according to claim 1, 2, or 3, wherein a beam measuring instrument which measures a current density distribution in the width direction of the ion beam emitted from said ion source is disposed at a position which is inside said vacuum chamber, and which is opposed to said ion source across a passage for the substrate, said ion source being located at a predetermined angle with respect to the substrate.

[5] ~~An ion beam irradiation apparatus according to claim 4,~~ wherein said beam measuring instrument is disposed at a position opposed to said ion source which is located at an angle that is substantially perpendicular to the substrate.

[6] An ion beam irradiation method which uses an ion beam irradiation apparatus according to claim 4 or 5, wherein said method comprises the steps:

locating said ion source at an angle at which said ion source is opposed to said beam measuring instrument, and, with using said beam measuring instrument, measuring the current

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density distribution of the ion beam emitted from said ion source;

then determining whether the measured current density distribution is within a predetermined allowable range or not, proceeding to a next step if within the allowable range, and, if not within the allowable range, adjusting the current density distribution to be within the allowable range;

then locating said ion source at a predetermined angle required for processing the substrate; and

then applying a process on the substrate by irradiating the substrate with the ion beam from said ion source while driving the substrate by said substrate driving mechanism.